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ABSTRACT

Modeling the functions of a teacher in a computer interface is not a new practice; most computer applications employ electronic performance support systems (EPSS) such as online help, wizards, coaches, and even some forms of artificial intelligence. This paper presents easy-to-implement strategies for increasing learner autonomy by embedding teacher functions within the World Wide Web-based graphical user interface (GUI). The embedded teacher (ET) model proposed in this paper is similar to the butler model, which describes a good interface as performing many of the roles of a good butler (e.g., helping a person enter, exit, and move from room to room). The ET model combines the butler model with core and complementary information zones by recommending that four overall teacher functions be embedded into a GUI: (1) orienting the learner; (2) providing navigational assistance; (3) providing instructional strategies; and (4) providing interactive feedback. Altogether these four elements work to perform the essential tasks of a live teacher. Anticipated questions for each of the four teacher functions are listed. A description is then provided of how each stage of the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) was used to address the ET when creating a GUI for a university computer course. (AEF)

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Using ADDIE to Design a Web-Based Training Interface

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Using ADDIE to Design a Web-Based Training Interface

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Creating instruction for the World Wide Web is a complex task requiring multiple levels of design effort and skill. Accustomed to traditional face-to-face instruction, many learner's struggle in training settings like the Web which require self-direction. Since teachers are not readily available to answer questions as they arise, learners in Web environments often need an additional layer of instruction: instruction on how to take part in instruction. The instructional designer is challenged with the dual task of designing good instruction *and* clear directions for accessing and using the instruction.

The phenomenon of distance between the teacher and the learner in Web-learning environments requires optimizing a learner's sense of autonomy (Moore and Kearsley, 1996). Where in the past designers focused on designer-controlled events (the pursuit of the perfect mix of objectives and strategies for the maximum number of learners), designers in Web-environments focus on creating learner-controlled events (embedding strategies to increase the self-direction of the learner.)

While most instructional designers have considerable skill and experience in designing content, few have experience in designing optimal learner-control environments. The designer must create obvious ways for learners to interact with training by chunking content into menu/sub-menu structures, providing navigation tools, embedding instructions on how to go about learning in a Web-environment, designing feedback mechanisms such as LISTSERVS and Web chat rooms, to name a few. In short, the designer must proactively address many of the tasks innately performed by a teacher.

Criteria for designing learner-control are not well-defined and many instructional designers lack confidence when confronted with the task; in large part because few designers have the knowledge, skills, or experience in the design of graphical user interfaces (GUI.) A graphical user interface is defined as the form of communication between users and computers that facilitates interaction (Mok, 1997). GUI for Web-based training encompasses all interactions between a learner and the Web-based learning environment. Design for Web-based GUI includes creating all of the visual elements on the Web-based computer screen that help learners perform the task of learning.

Designing a Web-based GUI is a daunting task. Limited screen real-estate (space for communication,) the "lost in space" phenomenon of hypertext (Jonnasen, 1991), anticipation all of the design and technical problems learners can encounter in a virtual classroom (receiving instructions, motivation, participation issues, etc.), are just some of the challenges of Web-based design. As stated above, to accommodate these issues requires the designer to embed many of the functions of a teacher into the interface.

Modeling the functions of a teacher in a computer interface is not a new practice. Most computer applications today employ electronic performance support systems (EPSS) such as online help, wizards, coaches, and even some forms of artificial intelligence (such as Microsoft's personal assistant feature) that perform many of the functions of a teacher. The design and development skills required to produce EPSS fall into many domains outside education. Skills in graphic design, message design, human factors, advertising, cognitive engineering, and computer science are just some of the disciplines involved in the development of EPSS. Rarely is one person, or disciplinary field, skilled in all areas of design required (Mok, 1997). Until EPSS development tools are easier for the typical instructional designer to manipulate and use, embedding teacher functions into a learning environment will need to take a less sophisticated form. This paper presents easy-to-implement strategies for increasing learner autonomy by embedding teacher functions within the graphical user interface.

The embedded teacher (ET) model proposed in this paper is similar to the butler model (Hoekema, 1984) which describes a good interface as performing many of the roles of a good butler. A good butler help a person enter, exit, and move from room to room within a house. Additionally, a good butler learns the preferences of visitors, bringing them beverages they like, and learning to small-talk about the visitor's interests. A good butler however, doesn't interact with visitors on a learning level. A butler isn't typically trained to assess where the learner is, where the learner needs to go, and the best strategy for getting the learner where they need to be.

Schwier and Misunchuk (1993) address interaction on the learning-level, by identifying the need for core and complementary instructional zones in an instructional interface, as well as the need for interactive feedback. Core information zones refer to a consistent placement of key instructional information. Complementary zones refer to consistent placement of instructional elaboration, if needed. An example of core information might be descriptive information about a task, such as changing a bicycle tire. An example of complementary information might be a drag and drop computer environment that would allow a learner to practice changing the tire by dragging and dropping the appropriate objects in a correct sequence.

The ET model combines the butler model (Hoekema, 1984) with Schwier and Misunchuk's (1993) core and complementary information zones by recommending four overall teacher functions be embedded into a GUI: 1) Orienting the learner, 2) Providing navigational assistance, 3) Providing instructional strategies (core and complementary information zones), and 4) Providing interactive feedback. Altogether these four elements work to perform the essential tasks of a "live" teacher. Table1 below lists anticipated questions for each of the four teacher functions. By addressing each of these questions, a designer is able to embed the supportive roles played by a good teacher.

Table 1.
Embedded Teacher Functions.

Anticipated Questions For Each Teacher Function
Orienting The Learner What is the topic of learning? How do I begin learning? What is the nature of the learning climate? Friendly, fun, serious, scholarly? What is the breadth of the learning environment? What, in general, is expected of me in this learning environment?
Providing Navigational Assistance What is the depth of this environment? Where am I in this process? Can I mark where I am in the process? What do I do now? What do I do next? How do I proceed here? What is the decision-making process that I must follow? How do I go back to what I just did? How do I get out of this?
Providing Instructional Strategies How do I interact with this instructional strategy? Can I get more/less information? More or less examples? Can I skip this information?
Providing Interactive Feedback Am I doing the right thing? Am I right/wrong? How did I end up here? Can I undo what I just did? Can I customize this?

The Embedded Teacher (ET) model (Table 2) presented uses the framework of the ADDIE design model. ADDIE is the acronym for the Analysis, Design, Development, Implementation and Evaluation phases of the instructional design process. The following section describes how each stage of the ADDIE model was used to address the ET model when creating a GUI for a university course teaching *Corporate Course Design*.

Table 2.
The ET Model.

ADDIE Stage	Description of ADDIE stage and embedded teacher implementation
Analysis	The analysis phase involves front end investigation of learner, content, and task and how these variables influence the design of instruction. Analysis of content sequencing results in the design of the basic GUI navigational structure. *ET functions addressed at this stage include:* - Orienting the learner - Providing navigational tools
Design	The design phase addresses how instructional goals and objectives shape instructional strategies. Instructional strategies are shaped into core, complementary, and interactive feedback information zones. *ET functions addressed at this stage include:* - Providing instructional strategies - Providing interactive feedback
Development	The development phase addresses the tools and processes used to create instructional material. *ET functions addressed at this stage include:* - Coding the GUI and creating all multimedia elements
Implementation	The implementation phase addresses the execution of the instructional materials or program in a training environment. Learners use the GUI to take part in training/instruction. *ET functions addressed at this stage include:* - Observing how learner's interact with the GUI
Evaluation	The evaluation phase addresses both formative and summative assessment processes. *ET functions addressed at this stage include:* - User-testing the GUI for effectiveness, efficiency, and appeal - Addressing how well the product orients learners, provides navigational assistance, presents instructional strategies, and provides interactive feedback

The Analysis Stage

During analysis the designer identifies learner, content and delivery needs. The designer's goal is to match the form and content of training with learner needs and preferences. The designer becomes familiar with the format of content at a high-level and is able to address

thematic elements of the instructional interface. The designer arranges content into a presentational sequence and establishes "the lay of the land."

Analysis Questions

"What is the instructional topic?" is addressed for the *Corporate Course Design* class by placing the topic in a prominent location (see letter A in Figure 1) and by using an image of corporate architecture. "What is the breadth of the course?" is addressed by providing an overview of the entire course in the left section of the GUI. Project numbers and semester dates show course scope (see letter B in Figure 1). "How do I get started?" is addressed by the words "Start Here" accompanied by a prominently displayed arrow. Project numbers identify a sequence for learners to follow (see letter C in Figure 1). "What is the instructional climate?" is addressed using corporate look and feel (see letter D in Figure

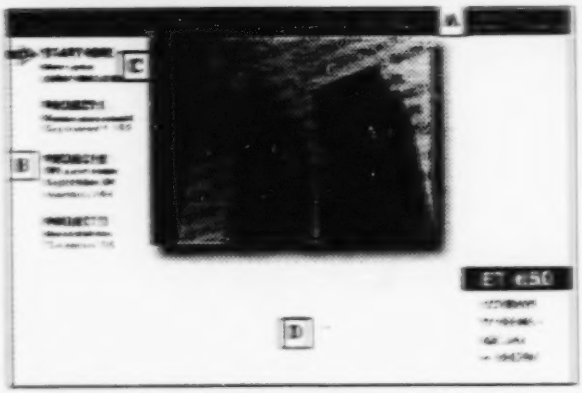

Figure 1. Orientation Functions Identified During Analysis.

Navigation Questions

"What is the depth of this environment?" is addressed (see letter E in Figure 2) using a flowchart structure to represent submenu sections. Each element on the flowchart represents a major task/lesson. "Where am I in the process? Can I mark where I am?" The large arrow (see letter F in Figure 2) marks the learner's location in the lesson, serving as a *You are here* reminder. Learners, however, cannot mark where they have been in the program. It's up to the learner to remember which sections of the program they have completed. "What do I do now, next? How do I back up?" The flowchart metaphor (see letter G in Figure 2) guides learners to complete the highest element on the flowchart before completing lower elements. Learners can click on previous sections to back up. "How do I get out of this?" Clicking the home button (See letter H in Figure 2) allows learners to exit.

The Design Stage

During design, the designer uses information from the analysis stage to create instructional strategies which address the instructional goals and objectives. These strategies are shaped into core, complementary and interactive feedback information zones. Core information zones are used for the presentation of key instructional content. Complementary information zones are used to provide learner practice and elaboration. Interactive feedback zones are used to provide learner assessment and remedial feedback. For the *Corporate Course Design* course, these zones were established using a *teacher* icon and a *conference room* icon (see Figure 3) for presentation of core information, and a *drafting table* icon for complementary information. Interactive feedback was implemented using the *briefcase* icon and the *teacher* icon. The teacher and conference room icons branch to pages which present background information and requirements. The drafting table icon provides instructions and space for learners to practice what they have learned. The briefcase icon allowed learners to submit work. The teacher icon in subsequent sections of the lesson responds to learner's work by making suggestions, addressing weaknesses and strengths (interactive feedback).

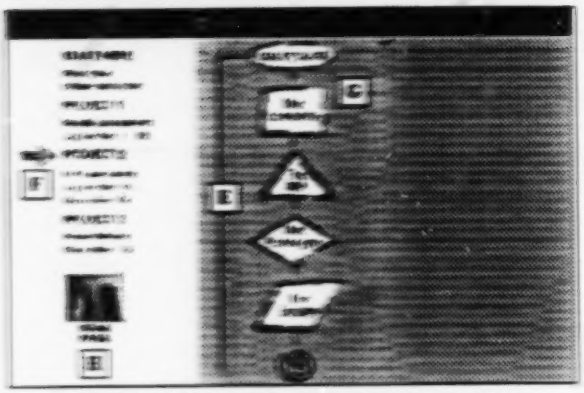

Figure 2. Navigation Functions Identified During Analysis.

Instructional Strategy Questions

"How do I interact with this instructional strategy?" Numbers next to the teacher, conference room, drafting table and briefcase icons (see letter I in Figure 3) indicate a sequential order for the learner. Instructions next to numbers describe in general terms what the learner is to do. "Can I get more/less information? Can I skip information?" is addressed by putting all of the tasks the learner must perform in the same visual space (see letter J in Figure 3). Learners control the amount of information they receive by clicking or not clicking. Because all relevant information is contained in the same visual space, learners see the "big picture" and understand the context of what they are choosing to explore or skip.

Interactive Feedback Questions

"Am I doing the right thing? Should I be doing something differently?" is addressed using the teacher icon

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(see letter E in Figure 4) to approach learner performance. The words "Good work" let the learner know that they are on track. Suggestions for improvement and space for learner dialog are provided with the text box that has a LISTSERV function.

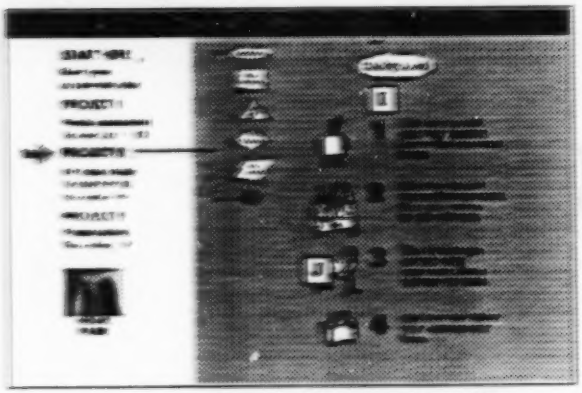

Figure 3. Instructional Strategy Functions Identified During Design.

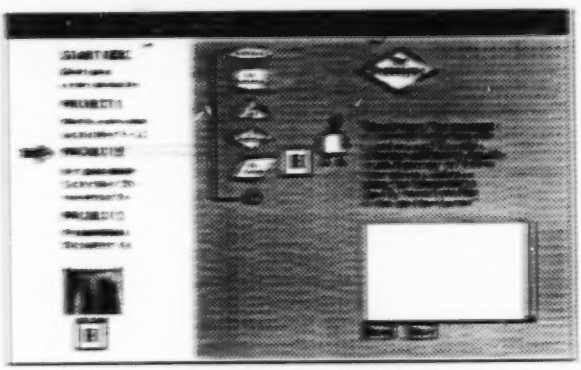

Figure 4. Interactive Feedback Functions Identified During Design.

Implementation and Evaluation Stages

User-testing of design, following recommended formative evaluation methodology (Flagg, 1990), will conclude the ADDIE process of GUI design for the *Corporate Course Design* class. User-testing will involve a series of one-on-one tests of the materials. Individual users will be asked to think aloud while working through the *Corporate Course Design* interface. Prompts to address each of the questions embedded into the interface will stimulate learner response if necessary. User responses will be used to modify the design and to identify additional questions needed by the ET model. After one-on-one testing, small groups of two or three individuals will test the interface. Again, user comments will be addressed by modification of the ET model and interface. The final pilot test of the product will be conducted in future semester sections of *Corporate Course Design*.

Future Studies

Several questions guide future evaluation and design of the ET model. One obvious set of questions must be asked: "Do the embedded teacher functions work?; Are learners able to direct themselves through instruction without the intervention of a live teacher?" To address these questions, a control group using an interface not implementing the ET model could be tested. Another question, "How direct (realistic) do teacher functions need to be?" can be addressed by comparing the interface presented in this paper with interfaces that are both more and less direct/realistic. Do users need to see the *lay of the land* to know where they are in a program? How much detail is needed to help users see the lay of the land? Does a separate syllabus need to be included into the interface, or can the syllabus be embedded into the interface? Until sophisticated technology that allows a simulated teacher (similar to Microsoft's personal assistant) to be easily integrated into Web courses, these and other questions can direct efforts in designing optimal learner control environments for Web learners.

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